

**Final Close-Out Report  
for  
Vancouver Water Station 4 Superfund Site  
WAD988475158**

**City of Vancouver  
Vancouver, Washington**

June 2017

**Prepared by:  
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Region 10  
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Date:



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**Final Completion Report  
Vancouver Water Station 4  
WAD988475158  
Vancouver, WA**

## **I. INTRODUCTION**

This Final Close Out Report (FCOR) documents that the U.S. Environmental Protection Agency (EPA) has determined, in accordance with Close Out Procedures for National Priorities List Sites (OSWER Directive 9320.2-22, May 2011), that all appropriate response actions at the Vancouver Water Station 4 (WS4) Superfund Site (Site) have been successfully implemented by the EPA with support from the City of Vancouver (City). The City took responsibility for operating and maintaining the treatment system and for completing the monitoring necessary to assure the remedy was operating in accordance with the September 1, 1999 Record of Decision (ROD) issued for the Site.

## **II. SUMMARY OF SITE CONDITIONS**

### ***Background***

WS4 is a public water supply wellfield in the City of Vancouver, Washington and is located approximately ½ mile north of the Columbia River (See Figure 1). The wellfield has been owned by the City for over 50 years. The site is defined as the wellfield that is owned by the City and located adjacent to commercial and residential areas. A summary of activities associated with the Superfund Site are listed in Table 1.

The WS4 wellfield encompasses approximately ½ acre and includes six production wells, two air stripping towers, one capped well and several support buildings (See Figure 2). Water from WS4 is blended together with water from several other wellfields to provide drinking water to the Vancouver region. Prior to the discovery of tetrachloroethene (PCE) in the groundwater, WS4 provided about 25% of the public water supply for the City of Vancouver. However, it is currently used mainly to help meet peak demands, generally during the summer months.

The upper portion of the aquifer from which WS4 draws its water is approximately 200 feet below ground surface. The aquifer supplies water to several municipal wellfields as well as a few private wells that are used primarily for irrigation. None of the private wells near the Site are known to be used as a drinking water supply. All new development within the city is required to connect to the public water supply system for all drinking water needs. Groundwater flows to the south/southwest and discharges into the Columbia River.

### ***Initial Investigation***

In March 1988, consistent with requirements of the federal Safe Drinking Water Act (SDWA), the City began monitoring WS4 and its other wellfields for volatile organic compounds (VOCs). Results of the monitoring indicated a persistent presence of PCE in the water at Water Station 1 and 4 (WS1, WS4). In February 1989, in consultation with the Washington State Department of Health, the City notified the public of the presence of PCE in the groundwater at the two water

stations and identified the actions the City was taking to limit exposure and assure the water delivered to its customers did not have PCE concentrations above the maximum contaminant level (MCL) established under the SDWA.

Starting in 1989, the City and EPA conducted several investigations into the source or sources of PCE at WS4 including sampling of private wells, nearby surface waters and industrial sumps; conducting soil gas surveys and inspecting local dry cleaners and other places of business where PCE may have been used.

The groundwater data indicate that a pulse, or concentrated volume of PCE passed through the wellfield over a period of several years beginning in 1992. PCE concentrations suddenly increased in 1992, peaked in 1993 and then decreased over the next several years. The maximum concentration of PCE detected during this time period was 520 µg/L. In January 1992, the City began operating an air stripping treatment system to reduce PCE levels below the MCL of 5 µg/L.

Between 1992 and 1997, funding constraints limited EPA's efforts to identify potential sources of the contamination. A 1997-98 investigation explored historic uses of PCE and PCE disposal practices in the vicinity of the WS4. Although multiple sources of PCE (e.g., dry cleaners) were located, no source was identified as primarily responsible for the sustained high concentrations and for which any additional source control actions could be taken. EPA concluded that, while the dry cleaners near the water station may have contributed to some PCE in groundwater, there was a strong likelihood that an unidentified source were responsible for the spike in PCE levels detected in 1992-93. Based on these studies and the significant reduction of PCE that occurred between 1993 and 1998, EPA concluded that there was not an on-going source of PCE.

#### ***Basis for Taking Action***

Water samples collected between 1988 and 1993 indicated the presence of PCE at concentrations up to 520 µg/L. In response, the City ceased pumping at several of the WS4 production wells and limited production at other wells such that the water distributed to customers remained below the MCL of 5 µg/L. In 1992, the City began operating an air stripping system to treat the groundwater prior to distribution. Due to the persistent levels in groundwater, on July 29, 1991, EPA proposed WS4 for listing on the National Priorities List (NPL) (56 FR 35840). The NPL listing for the site (WAD988475158) was finalized on October 14, 1992 (59 FR 47180).

A baseline risk assessment completed by EPA quantified potential carcinogenic risks to future residents consuming untreated water ranged from  $5 \times 10^{-6}$  to  $2 \times 10^{-5}$  cancer risk or 5 to 20 excess cancers in 1,000,000 people) and non-cancer risk from a hazard index of 0.02 to 0.2. While this level of risk is within the National Contingency Plan (NCP) acceptable risk range, EPA found it was necessary to take action at WS4 because the groundwater had been shown to have persistent concentrations of PCE above the MCL. This decision was consistent with EPA guidance (*Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions*, 1991) and with the requirement in the NCP that MCLs be met in groundwater, not just at the tap.

#### ***Record of Decision***

The EPA issued the ROD for Vancouver Water Station 4 on September 1, 1999.

### ***Contaminant of Concern***

The ROD identified tetrachloroethylene (PCE) as the only Contaminant of Concern (COC).

### ***Remedial Action Objectives***

The RAOs are:

*Protect human health by reducing concentrations of PCE and other VOCs in drinking water produced from WS4 to below the MCL specified in regulations promulgated under the federal Safe Drinking Water Act (SDWA) and in the state drinking water regulations.*

*Protect human health by reducing concentrations of PCE and other VOCs in groundwater at WS4 to below the Method A cleanup level specified in the Washington State Model Toxics Control Act (MTCA) regulations and below the federal and state drinking water standards (MCLs).*

The ROD established a groundwater cleanup level of 5 µg/L for PCE. This level was, and continues to be, consistent with both the federal MCL and the state groundwater cleanup level for PCE.

### ***The Selected Remedy***

The selected remedy called for pumping WS4 at a rate consistent with customer demand, treatment of the water using air stripping, and distribution of the treated water to customers as drinking water. The selected remedy also included monitoring of the water extracted from each monitoring well as well as the treated drinking water supplied to customers. The remedy did not include any source control actions.

Air Stripping - EPA's selected remedy required continued operation of the City's air-stripping system at WS4. The City installed the air stripping system in 1992 and continues to operate and maintain the system. The treatment continues to reduce the PCE concentration in the drinking water to below detectable levels, thus eliminating the threat posed to human health from exposure to PCE in drinking water. According to the ROD, treatment is to be continued until the City, the Washington State Department of Ecology (Ecology), and EPA agree that the remedial action objectives have been met and the treatment can be terminated.

Groundwater Cleanup - No ongoing source for the PCE in the groundwater at WS4 was identified. Therefore, the remedy focused on treatment of the groundwater extracted for drinking water purposes. Even though PCE sources were not specifically addressed, the concentration of PCE in groundwater pumped from the production wells was expected to eventually decrease to a level below the MCL. As such, the ROD selected the continued use of this "pump-and-treat" system as the means of reducing the concentration of PCE in groundwater near WS4, eventually flushing out residual contaminants in the wellfield to a level that would attain remedial action objectives.

Groundwater Monitoring - The selected remedy included periodic monitoring of the groundwater to evaluate the effectiveness of, and the need for, continued operation of the treatment system. Water quality samples were taken at each production wellhead and at a point following treatment but prior to distribution to customers. Decisions on whether to continue and/or modify the

monitoring program were to be made by EPA in conjunction with the State and the City.

**Institutional Controls** - No Institutional Controls were identified as part of the selected remedy as all domestic water in the area is supplied by the City and is thus treated under the selected remedy.

#### ***Remedy Implementation***

The air stripping system at WS4 has been effectively removing PCE from the City's water supply since 1992 and thus, was incorporated into EPA's 1999 remedy. Groundwater pumped from the WS4 production wells is treated by the air strippers and distributed to customers as drinking water. The treatment system can treat up to 4000 gallons per minute or approximately 2.75 million gallons per day. However, the actual production rate is based on demand and is generally considerably less.

Monitoring of PCE levels in the groundwater and drinking water is performed by the City. In addition, EPA collected water samples prior to each Five-Year Review and analyzed the samples for PCE and other volatile organic compounds (VOCs).

A Preliminary Close Out Report documenting the completion of construction activities was signed by EPA on September 8, 1999. The Site was identified as "Sitewide Ready for Anticipated Use" on March 11, 2014.

### **III. MONITORING RESULTS AND ATTAINMENT OF GROUNDWATER CLEANUP LEVELS**

The 1999 ROD requires treatment and groundwater monitoring until such time as the PCE concentrations at all monitoring locations is below the MCL of 5 µg/L. As there have been no changes to the federal or state drinking water standards for PCE or changes in the toxicity factors for PCE since the ROD was issued, this cleanup level remains protective of human health and the environment.

In January 2017 the City provided EPA with an Excel Spreadsheet containing the PCE data collected between 1988 and 2016. (COV, 2017). The City currently samples six (6) production wells and the effluent from the North and South Stripping Towers every other week. Table 2 presents a summary of the PCE data collected between 2009 and 2016. Samples taken from the production wells reflect conditions prior to treatment; samples from the North and South Tower were collected after treatment and is representative of the water distributed to customers.

In August 2014 the EPA published a "*Recommended Approach for Evaluating Completion of Groundwater Restoration Remedial Action at a Groundwater Monitoring Well*" (OSWER 9283.1-44, August 2014). This recommended approach focused on two phases of monitoring, the *remediation phase* and the *attainment monitoring phase*.

At this Site, the remediation phase began in 1992 when the stripping towers were installed. Trend plots of data collected from each monitoring location between 2003 and 2012 were presented in the 2013 Five-Year Review. Figure 3.0 presents the PCE concentrations reported at the six production wells between January 2004 and November 2008 illustrating the PCE

reductions that occurred during the remediation phase. By the end of 2008, PCE concentrations at all production wells were close to the MCL of 5 µg/L. While not plotted, data collected following treatment was consistently below the MCL and, in most cases, below the analytical reporting limit.

The PCE concentration trend for January 2009 to December 2016 is provided in Figure 4.0. These data indicate that the PCE concentrations at all wells had dropped to below the MCL of 5 µg/L by October 2011 and have remained below the MCL. Based on these data, EPA has determined that, for purposes of assessing attainment, all wells had reached the attainment monitoring phase by the end of 2011. Figure 4.0 displays the attainment monitoring from October 2011 to December 2016.

EPA's 2014 groundwater approach recommended that a minimum of eight (8) data points be used to evaluate attainment at each monitoring location and that cleanup levels be attained at all wells prior to Site Completion. Figure 4 presents the data collected from the six production wells and the effluent following treatment at the South and North stripping Towers between January 2009 and December 2016. In December 2016, the PCE concentration at all wells were below 3 µg/L and had been below the MCL of 5 µg/L since October 2011. EPA has performed a visual (non-statistical) evaluation of the data collected over the last five years and found all the data indicates attainment of the MCL at all data points. As part of EPA's Sitewide Ready for Anticipated Use determination, EPA determined the trends at all production wells had either a statistically significant zero or negative slope indicating steady-state conditions or decreasing concentrations (EPA, 2014). Since no rise in PCE concentrations have been observed since that work, EPA has found that calculating a UCL or completing additional trend analyses is not needed. Based on this review of the data, EPA has determined that the cleanup goal of 5 µg/L for PCE has been attained at each of the monitoring locations.

In order to further assess the protectiveness of the remedy, EPA analyzed VOCs in groundwater samples collected in advance of the 2003, 2008 and 2013 Five-Year Review. PCE was the only analyte to be detected during these sampling events. Based on these results, EPA expects the MCL for all VOCs to be met in the drinking water and groundwater at WS4.

Due to the potential carcinogenicity of 1,4-dioxane and its association with PCE and other VOCs, in 2003 EPA analyzed samples for 1,4-dioxane (EPA, 2003). 1,4-dioxane was not detected in any of the samples and thus, is not expected to be a concern at WS4.

EPA has found no significant changes at the Site that may affect protectiveness of the remedy selected in the 1999 ROD nor identified any other information that would call into question the protectiveness of that remedy. As such, EPA finds that the results of the groundwater sampling have demonstrated attainment of the groundwater cleanup levels and RAOs established for this Site and that the remedy has been successfully implemented. No further treatment or monitoring are required under CERCLA.

#### **IV. SUMMARY OF OPERATION AND MAINTENANCE REQUIRED**

No further operations or maintenance actions are required under CERCLA. Monitoring and

reporting required under the Safe Drinking Water Act are not affected by this determination. The City is currently evaluating whether to continue operating the air strippers for purposes other than removal of PCE from the Water Station.

## **V. DEMONSTRATION OF CLEANUP ACTIVITY QUALITY ASSURANCE & QUALITY CONTROL**

The Preliminary Close Out Report documented completion of construction activities at the Site and concluded that the "City of Vancouver had constructed and is operating the remedy in accordance with plans and specifications". Water quality samples collected by the City have been collected consistent with the sampling plan adopted for SDWA compliance. Samples were analyzed at an accredited lab secured through a competitive process.

The EPA collected groundwater samples from monitoring wells, production wells and influent & effluent from the treatment system June 2003, April 2008 and April 2013 as part of the Five-Year Review (EPA, 2003, 2008 & 2013). The objective of these sampling efforts was to determine the water quality or the concentration of PCE in the groundwater from selected monitoring wells, production wells, and influent & effluent. The samples were analyzed by the EPA Region 10 laboratory consistent with a Quality Assurance Project Plan. As part of each Five Year Review the EPA found that the data collected during the EPA sampling event compared reasonably well with the data collected by the City.

## **VI. FIVE-YEAR REVIEW**

Three policy five-year reviews have been completed at the Site, the last one in September 2013.

No issues or follow-up actions were identified as part of the 2013 Five-Year Review. The protectiveness statement stated that the remedy at Vancouver WS4 was "protective of human health and the environment because the treatment system is functioning as intended and human and ecological risks are under control. Long-term protectiveness of the remedial action will be verified by regular monitoring by the City of Vancouver."

The analysis conducted since the last Five-Year Review indicates that the remedy has been fully implemented and the RAOs and related cleanup levels have been attained. No hazardous substances, pollutants or contaminants remain above levels that could prevent unlimited use and unrestricted exposure. Therefore, no further Five-Year Reviews are required.

## **VII. SITE COMPLETION CRITERIA**

The implemented remedy achieves the degree of cleanup or protection specified in the 1999 ROD for all pathways of exposure. All selected remedial action objectives and associated cleanup goals are consistent with agency policy and guidance. This Site meets all the site completion requirements as specified in OSWER Directive 9320.2-22, Close-Out Procedures for National Priorities List Sites. All remedial activities at the Vancouver Water Station 4 Superfund Site are complete and the Site poses no unacceptable risk to human health or the

environment. Therefore, the EPA has determined that no further response action is necessary at the Vancouver Water Station 4 Superfund Site.

## REFERENCES

City of Vancouver, 2017, *Ground Water Quality Database for PCE, Water Station 1 and 4*, City of Vancouver, Vancouver, Washington, January 2017.

U.S. EPA, 1991, *Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions*.

U.S. EPA, 1999, *Record of Decision, Vancouver Water Station 4, Vancouver, Washington*.  
September 1, 1999.

U.S. EPA, 1999, *Vancouver Water Station #4, Preliminary Close Out Report*, September 8, 1999.

U.S. EPA, 2003, *Trip Report – Groundwater Sampling at the City of Vancouver's Water Station #1 & 4*, September 2003.

U.S. EPA, 2003, *First Five-Year Review Report for Vancouver Water Stations 1 and 4, City of Vancouver, Vancouver, Washington*, September 2003.

U.S. EPA, 2008, *Second Five-Year Review Report for Vancouver Water Stations 1 and 4, City of Vancouver, Vancouver, Washington*, September 2008.

U.S. EPA, 2009, *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities Unified Guidance, EPA 530/R-09-007*, March 2009.

U.S. EPA, 2013, *Third Five-Year Review Report for Vancouver Water Stations 1 and 4, City of Vancouver, Vancouver, Washington*, September 2013.

U.S. EPA, 2014, *Sitewide Ready for Anticipated Use*, March 11, 2014.

U.S. EPA, 2014, *Groundwater Statistical Tool User's Guide*, OSWER 9283.1-26, July 2014.

U.S. EPA, 2014, *Recommended Approach for Evaluating Completion of Groundwater Restoration Remedial Action at a Groundwater Monitoring Well*, OSWER 9283.1-44, August 2014.

**Table 1 Site Chronology**

<b>Event</b>	<b>Date</b>
EPA monitoring detected PCE contamination in WS1 and WS4	March 1988
City of Vancouver notified public of PCE groundwater contamination at both WS1 and WS4	February 1989
EPA/City began sampling in the vicinity of WS4	1989
4 highest contaminated WS4 wells taken out of service	April 1989
EPA proposed MCL for PCE (5 µg/L)	May 1989
City of Vancouver initiated investigations for potential PCE sources	July 1989
EPA initiated investigations for PCE sources	August 1989
City of Vancouver removed WS4 from service	November 1989
EPA Issued final MCL for PCE (5 µg/L)	January 1991
Redesigned air stripping system put into place for WS4	January 1992
NPL listed WS4, due to groundwater PCE	October 1992
Preliminary health assessment for WS4 released for public comment	April 1993
EPA postponed investigations on WS4 due to lack of funding	September 1993
EPA resumes work on WS4 investigation	November 1997
EPA conducts Final Remedial Investigation for WS4	1998
EPA releases final RI/FS report for WS4	May 1999
Proposed Plan for WS4 published	May 1999
WS4 ROD signed	September 1999
WS4 Preliminary Close Out Report signed	September 1999
Air stripping remedy implemented	1999 – present
First Five-Year Review completed	September 2003
Second Five-Year Review completed	September 2008
Third Five-Year Review completed	September 2013
Sitewide Ready for Anticipated Use determination made by EPA	March 2014

**Table 2**

**City of Vancouver – Water Station #4 Groundwater PCE Concentrations (µg/L) at the Production Wells and Stripping Towers Effluent January 2009 -December 2016**

Date	WS4-1	WS4-2B	WS4-3B	WS4-B	WS4-5B	WS4-9	South Tower	North Tower
1/2009	5	4.1	6	6.8	4.8	6.2	0.4	0.4
4/2009	6.7	3.1	4.9	6.1	3.3	4.7	0.4	0.4
8/2009	6.2	2.5	3.3	6.6	3.0	3.5	0.4	0.4
12/2009	4.3	2.2	4.3	6.7	2.6	4.7	0.4	0.4
1/2010	5.1	2.4	4.1	6.7	3.0	5.1	0.4	0.4
3/2010	5.2	2.3	3.5	5.3	3.0	3.9	0.4	0.4
7/2010	5.5	1.8	2.2	4.5	2.6	2.9	0.4	0.4
9/2010	6	2.3	3.3	5	2.9	3.9	0.4	0.4
7/2011	3.8	3.7	4.2	4.9	3.7	4.2	0.4	0.4
8/2011	2.3	1.3	1.8	3.1	1.5	1.5	0.4	0.4
10/2011	4.0	3.1	3.2	4.9	2.6	3.1	0.4	0.4
12/2011	3.9	4.1	3.6	4.8	2.6	4.1	0.4	0.4
2/2012	3.4	1.9	3.4	4.8	1.9	3.0	2.1	1.7
4/2012	3.7	1.6	2.4	4.2	1.7	2.4	0.4	0.4
6/2012	2.8	1.3	1.1	2.2	1.5	2.3	0.4	0.4
10/2012	3.8	2.7	4.2	4.3	2.1	3.6	0.4	0.4
5/2013	3.7	2.5	3.3	4.3	2.9	3.1	0.4	0.4
7/2013	3.6	1.9	2.6	3.9	1.8	2.5	0.4	0.4
9/2013	3.0	1.8	1.8	3.6	1.7	2.4	0.5	0.4
11/2013	2.5	1.9	2.2	3.1	2.0	2.3	0.4	0.4
6/2014	NA	1.5	NA	2.1	2.1	2.1	0.4	0.4
8/2014	NA	1.8	NA	2.7	1.9	2.0	0.4	0.4
10/2014	NA	1.9	NA	2.8	2.1	2.1	0.4	0.4
12/2014	NA	1.4	NA	2.5	1.7	1.8	0.4	0.4
5/2015	2.5	1.6	2.0	2.7	1.8	1.8	0.4	0.4
7/2015	2.3	1.7	2.5	3.0	1.8	2.0	0.4	0.4
9/2015	2.5	1.8	2.1	2.6	1.8	2.1	0.4	0.4
12/2015	1	1.6	2.0	2.0	2.0	2.1	0.4	0.4
1/2016	2.1	1.8	3.0	3.2	2.0	2.6	0.4	0.4
3/2016	2.4	1.3	1.6	2.3	1.7	2.0	0.4	0.4
8/2016	2.2	1.8	2.3	3.0	2.0	2.4	0.4	0.4
12/2016	2.3	1.6	2.4	2.8	2.0	2.1	0.4	0.4

All groundwater concentrations are µg/L

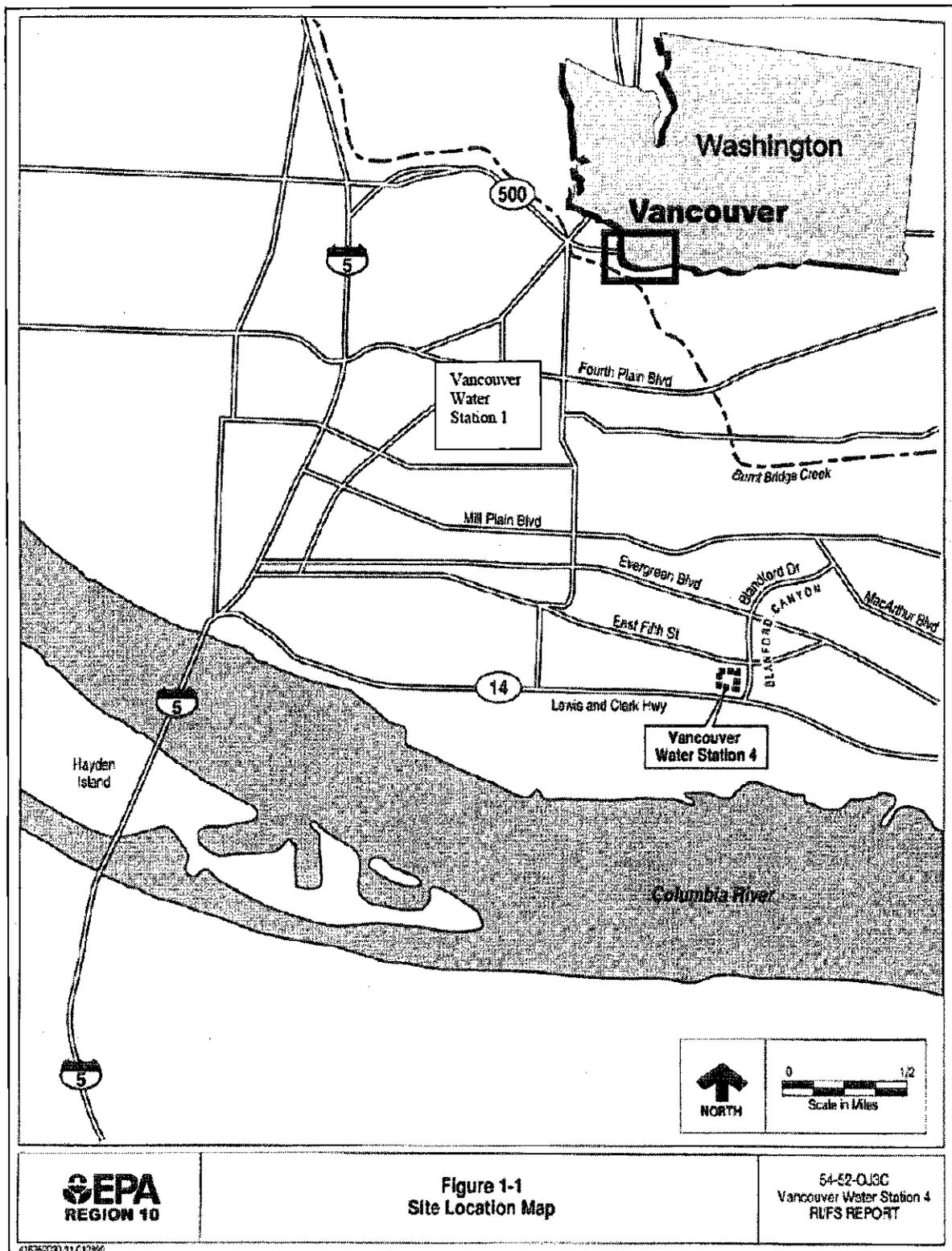
Highlighted values at or above MCL = 5 µg/L

The Reporting limit for PCE is 0.4 µg/L

NA- Not available for sampling

This data was provided to EPA-Region 10 by the City of Vancouver

The PCE water quality concentration for the South & North Stripping Towers are for the Production Wells after treatment or the effluent water sample.



**Figure 1 Site Location Map**

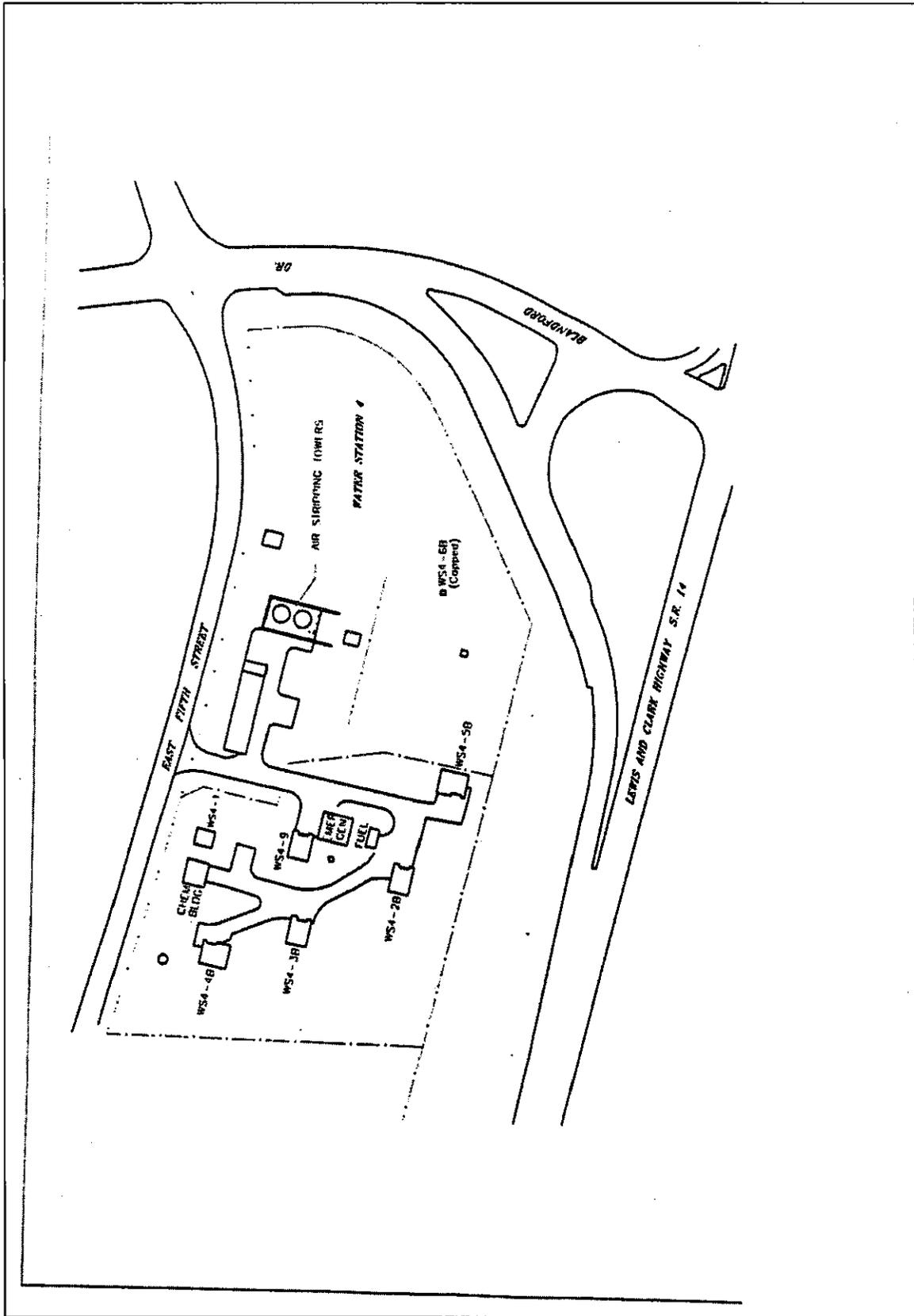
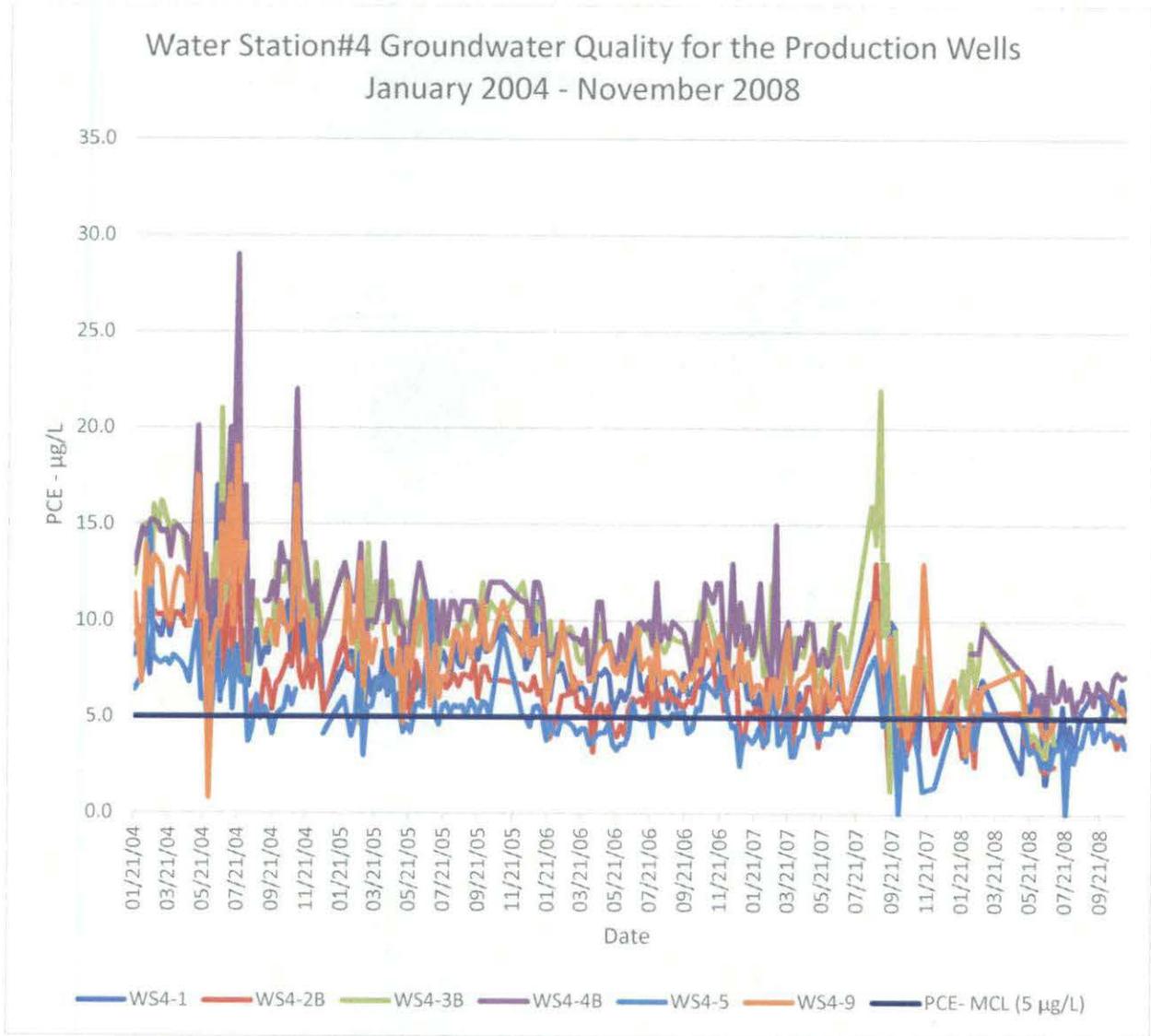


Figure 2 Production Wells for Water Station 4

Figure 3 Remediation Phase Monitoring January 2004 to November 2008



Treated water from North and South Stripping Towers was tested and not shown. All readings were close to or below the analytical reporting limit.

Figure 4. Attainment Phase Monitoring October 2011 to December 2016

